

Digging Deeper into the Data

Leon Rochester
September 16, 2003



“Cultural” Talk



- To participate in DC-1, you need only Level-1 data.
 - a dozen variables/event in FITS files
- But much more detailed data are available:
 - merit ntuple
 - full ROOT trees/GLEAM TDS, using event display



Output of Reconstruction

- “Level-1 data,” a FITS file with about a dozen pieces of information for each event
- “merit” ntuple, with over 230 variables
- full ROOT trees, 3 files for each event, containing essentially everything that there is to know about:
 - generated event, possibly including details of all the particles in the interaction chain
 - digitized event, corresponding to the raw data which would have been recorded for the event
 - reconstructed event, with all the information about the fitted tracks and vertices, calorimeter clusters, and distances of the hit ACD tiles from the tracks



merit Ntuple

- ROOT format
- named after the PDR merit ntuple, which was used to make cuts to reject background and choose photons
- mostly generated by the package AnalysisNtuple, and contains variables collected by Bill Atwood for use in his classification trees
 - very large
 - grew like Topsy, contains variables obvious (e.g. TkrNumTracks) and arcane (e.g. EvtCalEXTalRatio)
 - simple flat format for input to Insightful Miner
 - contains variables easily derived from existing variables, (e.g. McEnergy/McLogEnergy) included mainly to simplify classification trees



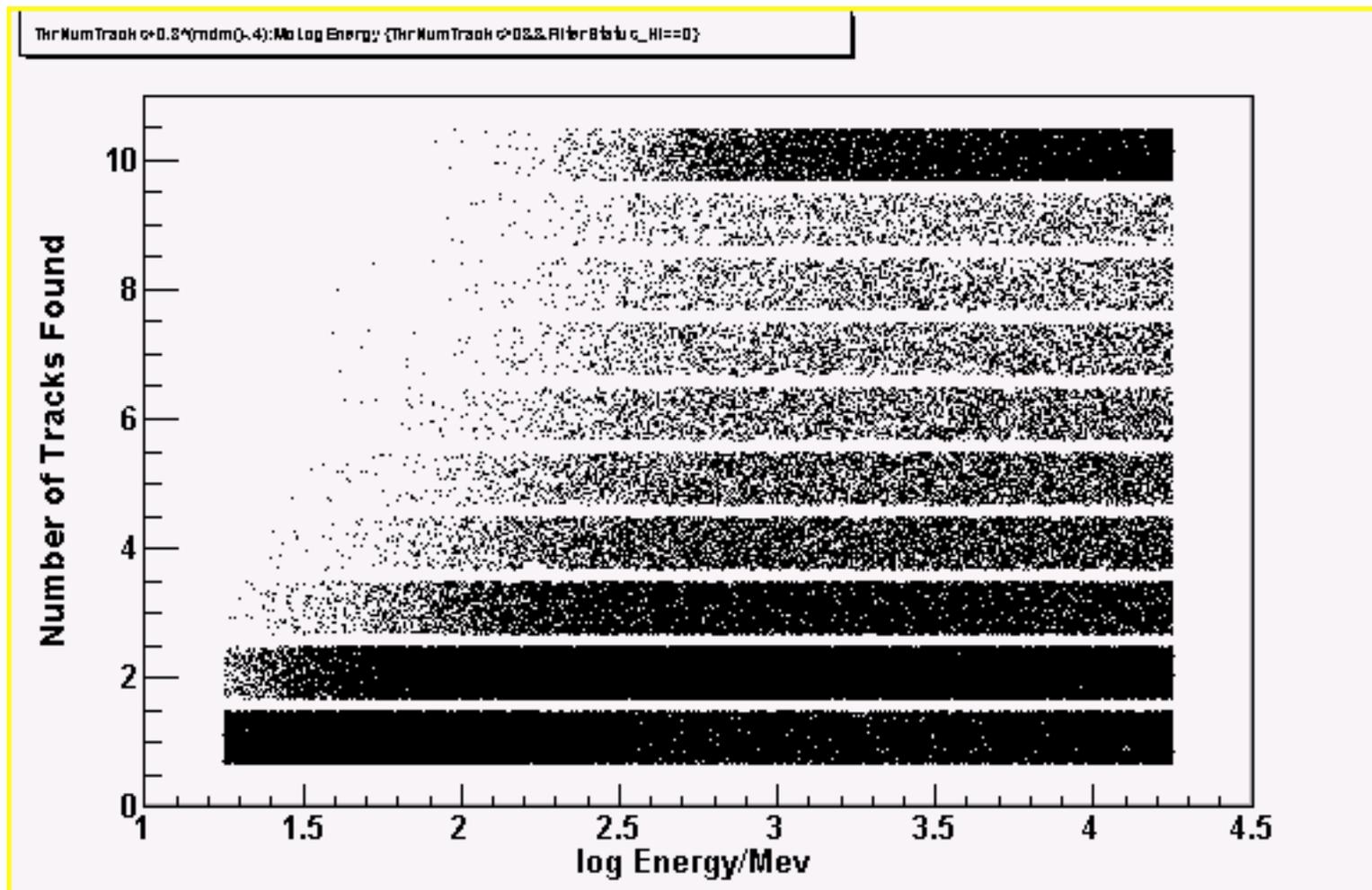
Contents of merit Ntuple

Documentation: Glast Software page -> Data Challenge Sept 2003 ->
-> Contents of merit ntuple

- Event Header
 - event ID
 - Onboard Filter Status
 - output of classification trees
- Monte Carlo
 - particle type, charge, energy
 - direction, conversion point
 - differences between found and generated direction, position
- Trigger
 - tower, layer, number of towers, type
- Tracker
 - number of tracks
 - lots of info about "best" & "next-best track"
 - energy in tracker
- Vertex
 - position & direction
 - quality factors
- Calorimeter
 - several kinds of energy
 - energy centroids, edge information
- ACD
 - numbers of hit tiles
 - distances to tracks
- "Event" information
 - combined info from more than one subsystem
 - "flattened" quantities

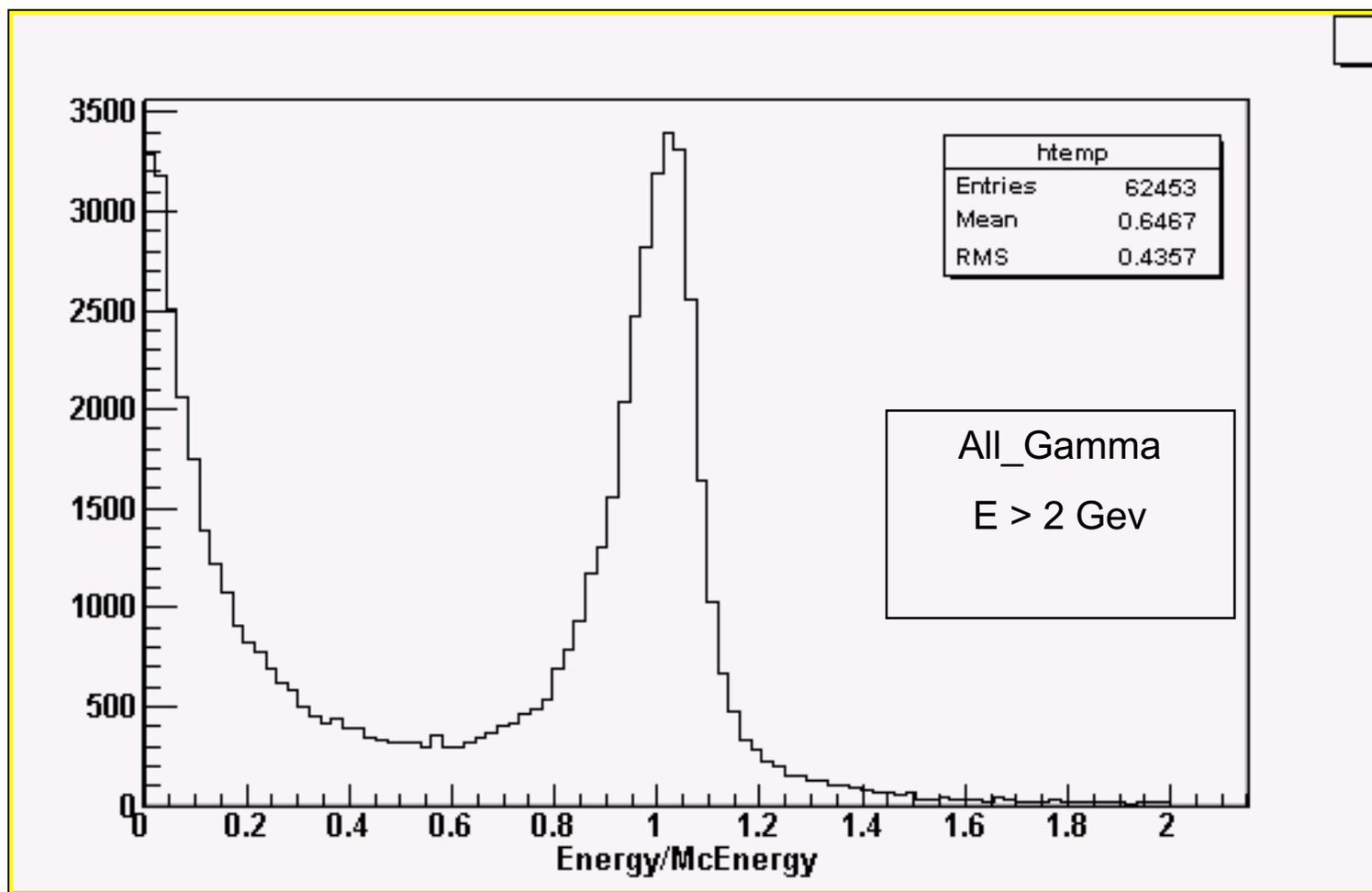


Using the MC information





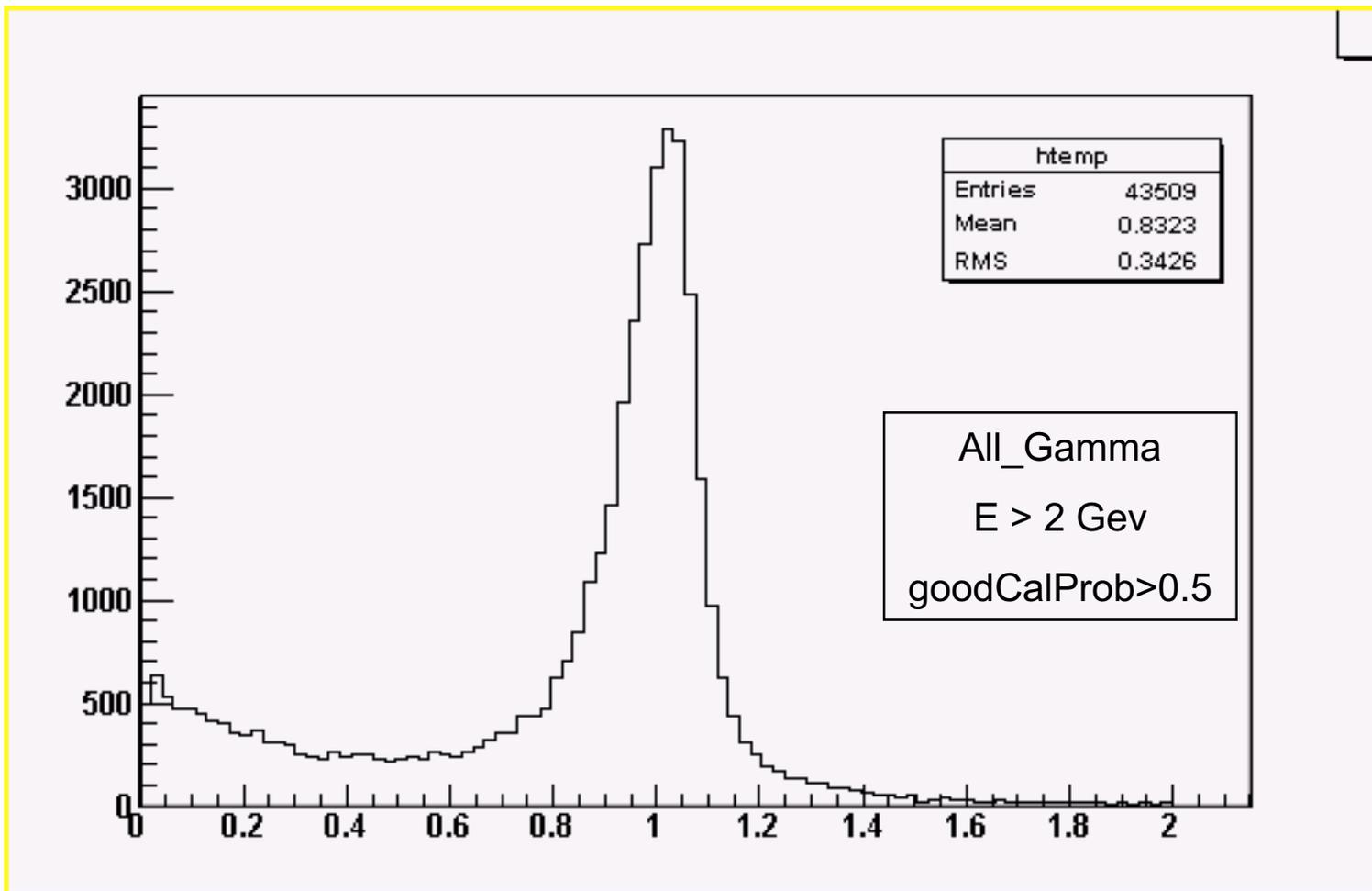
Another Plot using the MC info



Energy here means the total measured energy, including hit counting in the tracker and a complicated correction in the calorimeter



and now, with a Cut





Some Ntuple Issues

- At this point, the ntuple must be used with care.
 - Some names will probably change after this meeting.
 - There are a few details that aren't quite right. For example, the various quantities call "phi" are incorrectly calculated for angles in the 2nd and 3rd quadrants.
 - There are inconsistencies. For example, theta and phi are given for the best track and the vertex, but not for the MC track.
- It's not obvious where the ntuple goes from here:
 - Is it a tool for Bill's analysis? Or is it the "official" ntuple?
 - Can (should) it be both?
 - How do variables get added? (It's very easy to do inside of GLEAM, but how much control do we want over it?)
 - Can it be stable and flexible at the same time?



Using GLEAM Event Display

You've heard about FRED, which shows every promise of becoming the standard at some point.

GLEAM (GLast Event Analysis Machine), our event generation-reconstruction program, also has an event display. (In fact, it was the model for FRED.) It's currently the standard display, but has more or less stopped evolving.

GLEAM can read back previously created ROOT output files and display the events, or events can be displayed during the generation/reconstruction cycle, with somewhat more detail about the generated tracks.

In addition, GLEAM can be set up to rerun the reconstruction on any chosen event or events.



Why Bother?

I think that if you intend to use *GLAST* data, it would be a good idea to personally try “looking” at some simulated events.

The exercise will give you a better appreciation of the capabilities of the detector and the ways in which nature makes things difficult!

Unfortunately, we haven't as yet made it particularly easy to use *GLEAM* to do this, and at this point, running *FRED* is probably even a bit harder! But I hope it will become easier in the near future.